ORIGINAL ARTICLE

IJPHY

IMMEDIATE EFFECT OF CERVICAL MANIPULATION ON PAIN AND RANGE OF MOTION IN PATIENTS WITH CHRONIC MECHANICAL NECK PAIN

[*1]Kabir Isah Mayana
[2]Naziru Bashir Mukhtar
[3]Nura Abubakar

ABSTRACT

Background: Neck pain has been reported as a prevalent musculoskeletal disorder globally with more than half of the general population being affected once or more within their life span.

Methods: A randomized clinical trial research design was used which investigated the immediate effect of cervical manipulation on neck pain and cervical range of motion among patients with chronic mechanical neck pain. 20 male and female participants between the ages of 26 to 60 years with chronic mechanical neck pain attending physiotherapy clinics were recruited. They were randomly assigned into two groups (A and B) of 10 patients each. Group A received soft tissue massage, and cervical manipulation and group B served as the control group, and they received only soft tissue massage. There were two outcomes measured; Pain intensity was rated using visual analog scale (VAS) before and immediately after the intervention. Pre and Post intervention measurements of cervical spine range of motion using Goniometer were also taken.

Results: Findings of the study revealed significant immediate improvement of pain and Cervical Range of Motions ($p<0.05$) in all dimensions in the experimental group while Pain, flexion and right side Cervical flexion significantly improved in the control group. It was also found out after comparing the outcomes between the two groups that, the experimental group had significantly ($p<0.05$) better improvement than the control group in post-intervention pain, cervical flexion, cervical extension and cervical (right and left) lateral rotations.

Conclusion: Cervical manipulation is effective in immediate pain relief and improvement in cervical range of motion in patients with mechanical neck pain.

Keywords: Cervical, Manipulation, Mechanical, Neck Pain, Range of Motion, Outcomes.

Received 10th December 2017, revised 13th March 2017, accepted 08th May 2017

10.15621/ijphy/2017/v4i3/149070

www.ijphy.org

[2]Department of Physiotherapy,
Faculty of Allied Health Sciences,
Bayero University, Kano.
[3]Department of Physiotherapy,
Faculty of Allied Health Sciences,
Bayero University, Kano.

CORRESPONDING AUTHOR

[*1]Kabir Isah Mayana

Department of Physiotherapy,
Faculty of Allied Health Sciences,
Bayero University, Kano.
Email: kbmayana@yahoo.com

INTRODUCTION

Neck pain is a common musculoskeletal complaint within the general population, and more than half of the population would experience in their lifetime [1]. One-year prevalence of neck pain is between 30% and 50% [2]. Not all neck pains are disabling,

Only 2% to 11% disabling one-year neck pain prevalence was reported [3]. Disabling neck pain may lead to disabilities and consequently leading to economic and social problems [2,4,5,6].

Non-surgical and pharmacologic managements are commonly implored in neck pain management with physiotherapy [7]. Over half of the patients with neck pain consulted by physicians are asked to see physiotherapist [8]. Physical therapists commonly incorporate manual therapy of the neck region in the management of these patients. The techniques employed include passive joints mobilization and or manipulation [9].

In African study of non-public and public hospitals, neck pain complaints were found to be as common as low back pain complaint [10]. The results showed similar trends to international norms regarding neck pain presentation at other such centers around the world [3,6,11,12,13].

There is a dearth of studies carried out to determine the immediate benefit of cervical manipulation among neck pain patients. But few clinical trials have directly assessed its effectiveness. Although few studies have proven the long term effect of manipulation, this study, therefore, focuses on the short term (immediate) benefit of manipulation among neck pain patients of mechanical origin.

MATERIALS AND METHOD

Twenty (20) neck pain patients who met the inclusion criteria were recruited from the physiotherapy departments of Murtala Muhammad Specialist Hospital (MMSH) and Muhammad Abdullahi Wase Specialist Hospital (MAWSH), Kano, Nigeria. A purposive sampling technique was used in recruiting the patients.

Ethical clearance was obtained from Kano State Hospitals Management Board's Ethical Committee before the commencement of the study. All participants had adequate knowledge about the purpose and procedure of the study and Informed consents for participation were obtained, and all their questions were entertained for clarity before the commencement of the study, relevant physical investigations were carried out as well. Random sampling was used in assigning them into two groups (A and B) of ten participants each using ballot papers. Group A (Experimental group) received cervical region soft tissue massage, as well as cervical spine manipulation and Group B (Control group), received cervical soft tissue massage alone without cervical manipulation.

Each patient completed visual analog scale and had neck ranges of motion measured in all dimensions (forward flexion, side flexion; right and left, extension, rotation; right and left) using Goniometer before and after the treatment.

Before the procedure was started, each subject was made to sit quietly for 5 minutes for baseline measurements to be established. The participants were seated on a chair with the forearm resting on an arm support in a comfortable position with both thighs fully accommodated. The lower limbs were flexed to 90 degrees, feet resting on the floor and the neck flexed to a position of 20 degrees, cervical soft tissue massage was given after which the high-velocity low-amplitude (HVLA) thrust was applied by the physiotherapist using direction of therapeutic benefit, post-intervention measurements were immediately taken (Cervical Range of Motions and Pain levels).

Findings: Age of the participants was presented as means and standard deviation. Student t-test was used for analysis of inter and intra-group changes of the two groups. P value was set at ≤0.05 (significant). All analyses were performed using the Statistical Package for the social science (SPSS) version 15.

The mean age of the participants was 41.45 ± 2.69 years with a preponderance of male (55%) over female (45%).

The results of data analyses using descriptive and inferential statistics are presented in the following tables.

Table 1: Pain levels differences between the groups at pre-intervention and post-intervention

Pain level	pre-test (mean ± SD)	post-test (mean ± SD)
ETG	5.60±1.26	4.00±0.82
CTG	3.40±1.07	2.60±0.52
t-value	4.19	4.58
p-value	0.008*	0.00*

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation

Table 1 above shows the results of independent t-test for pain levels between the study groups before and post intervention. A significant difference was seen between the groups at pre and post intervention (p≤0.05). Although there is significant difference pre-intervention, the magnitude of the mean score change is only statistically significant but not clinically (mean difference of VAS scores between the groups <13mm) while at post intervention the magnitude of the mean score change is significant both statistically and clinically (mean difference in VAS scores between the groups >13mm) favouring treatment group.

Table 2: Cervical spine flexion at pre and post intervention

FLEXION	Pre-intervention (mean ± SD)	post-intervention (mean ± SD)
ETG	33.10±11.76	36.30±10.10
CTG	28.10±5.70	28.60±5.42
t-value	1.21	2.12
p-value	0.25	0.05*

ETG=Experimental group, CTG=Control group, *significant at 0.05 alpha level, SD= standard deviation.

Table 2 above shows the independent t-test for cervical flexion between the study groups, before the intervention, there was no significant difference between the groups, p=0.25 (p>0.05), While there was a significant difference after intervention p≤0.05.

Table 3: Cervical spine extension at pre and post intervention

Extension	Pre-intervention (mean ± SD)	Post-intervention (mean ± SD)
ETG	32.20±10.18	36.90±11.26
CTG	26.80±4.52	27.20±4.34
t-value	1.53	2.75
p-value	0.15	0.02*

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation.

Table 3 above shows the results of independent t-test for cervical spine extension between the groups. Before the intervention, the groups were comparable (p>0.05). At the end of the intervention, a significant difference was seen between the groups p≤0.05.

Table 4: Cervical spine right side flexion at pre and post intervention

Right side flexion	Pre-test (mean ± SD)	Post-test (mean ± SD)
ETG	31.50±5.08	38.30±8.78
CTG	37.20±5.75	36.50±5.77
t-value	-2.35	0.54
p-value	0.03*	0.60

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation

Table 4 shows the result of independent t-test for cervical right side flexion between the groups. Before the intervention (pre-test), the groups were comparable (p≤0.05). At the end of the intervention, there was no significant difference between the groups P >0.05.

Table 5: Cervical spine left side flexion at pre and post-test intervention

Left side flexion	Pre-test (mean ± SD)	post-test (mean ± SD)
ETG	29.50±6.35	36.80±9.34
CTG	36.90±5.28	36.90±5.97
t-value	-2.84	-0.03
P-value	0.01*	0.98

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation.

From the result of Table 5 (Independent t-test for cervical spine left side flexion between the study groups), before the intervention (pre-test), the groups were not comparable p≤0.05. Post intervention, no significant difference was seen between the groups p>0.05.

Table 6: Cervical spine right lateral rotation at pre and post-test intervention

Right lateral rotation	pre-test (mean ± SD)	post-test (mean ± SD)
ETG	51.70±10.88	61.60±13.13
CTG	47.40±6.22	48.40±6.22
t-value	1.09	2.87
p-value	0.30	0.01*

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation.

From the Table above, before the intervention (pre-test), the groups were comparable p>0.05, post-intervention, there was a significant difference between the groups p≤0.05.

Table 7: Cervical spine left lateral rotation at pre and post-test intervention

Left lateral rotation	Pre-test (mean ± SD)	Post-test (mean ± SD)
ETG	53.80±12.81	61.80±13.87
CTG	48.40±6.28	47.50±6.38
t-value	1.20	2.96
P-value	0.25	0.01*

ETG=experimental group, CTG=control group, *significant at 0.05 alpha level, SD= standard deviation

The result from Table 7 shows the results of Independent t-test for the left cervical rotation between the groups. Before the intervention, there was no significant difference between the groups P>0.05. Post (post-test) intervention, significant difference was seen P≤0.05

Table 8: Paired t-test for the Experimental Group

Variable	Pre (Mean ± SD)	Post (Mean ± SD)	t	df	p-value
FLEX (deg)	33.10±11.76	36.30±10.10	-4.50	9	0.00*
EXT (deg)	32.20±10.18	36.90±10.26	-5.66	9	0.00*
RSFLX (deg)	31.50±5.08	38.30±8.78	-5.04	9	0.00 *
LSFLX (deg)	29.50±6.35	36.80±9.34	-5.62	9	0.00*
RLROT (deg)	51.70±10.88	61.60±13.13	-3.71	9	0.01*
LLROT (deg)	53.80±12.81	61.80±13.87	-3.90	9	0.00*
PAIN (cm)	5.60±1.26	4.00±0.82	4.71	9	0.00*

*significant at ≤0.05 alpha level, FLEX= Flexion, EXT= Extension, RSFLX=Right side flexion, LSFLX=left side flexion, RLROT=right lateral rotation, LLROT=Left lateral rotation, deg=degree, cm=centimeter.

Table 8 shows the results of paired t-test for the experimental group comparing the neck range of motion before and after intervention in all planes.

A significant difference was seen in the following variables i.e. Flexion, extension, Right side flexion, left side flexion, right lateral rotation, left lateral rotation and pain. ($p \leq 0.05$).

Table 9: Paired t-test for the Control Group

Variable	Pre (Mean ± SD)	Post (Mean ± SD)	t	df	p-value
FLEX (deg)	28.10±5.70	28.60±5.42	-2.24	9	0.05*
EXT (deg)	26.80±4.52	27.20±4.34	-1.50	9	0.17
RSFLX (deg)	37.20±5.75	36.50±5.78	3.28	9	0.01*
LSFLX (deg)	36.90±5.28	36.90±5.97	0.00	9	1.00
RLROT (deg)	47.40±6.22	48.40±6.22	-1.27	9	0.237
LLROT (deg)	48.40±6.28	47.50±6.38	1.00	9	0.343
PAIN (cm)	3.40±1.07	2.60±0.52	2.23	9	0.05*

*significant at ≤0.05 alpha level, FLEX= Flexion, EXT= Extension, RSFLX=Right side flexion, LSFLX= Left side flexion, RLROT= Right lateral rotation, LLROT=Left lateral rotation.

The result from Table 9 shows the results of paired t-test for the control group comparing the pre and post intervention cervical range of motion in all planes.

No significant difference was seen Flexion, left lateral flexion, right lateral flexion and left rotation ($p>0.05$). But a significant difference was seen for Extension, right rotation, and pain ($p \leq 0.05$).

DISCUSSION

This study was conducted to investigate the immediate benefits of cervical manipulation on neck pain levels and neck range of motion among patients with mechanical neck pain. Though the participants were randomly assigned into the groups, at baseline (before intervention) the groups were not comparable in pain and therefore to address that, the concept of Minimal Clinically Important Difference (MCID) was used, which is "the smallest difference in score in the domain of interest which patients perceive as beneficial and which would mandate, in the absence of troublesome side effects and excessive cost, at change in the patients' management" as reported by Jaeschke et al (1989) [14] reporting pain level change not up to 13mm using a scale of 100mm may not be clinically important (Kelly, 2001) [15] hence the magnitude of the difference between VAS mean values for the study groups before intervention is clinically not significant (<13mm) but post intervention a clinically significant improvement of pain (VAS mean value difference >13mm) was reported in favour of the manipulation group. Therefore, the results revealed, cervical manipulation is effective in immediate relief of neck pain. Results also indicated a significant increase in the following cervical planes of motion after intervention when compared with the control group; forward flexion, backward extension, right and left lateral rotation except in the right and left sided flexion. The improvements seen in neck pain and ROMs are in line with a study that reports benefits of manipulation on pain and range of motion among neck pain patients of mechanical origin (Cassidy et al., 1992) [13] where both pain and range of motion improved after intervention. While, the findings of this study indicated that, all participants in the treatment group showed immediate improvement in pain and some of the planes of range of motion with cervical spine manipulation. It was also reported that cervical manipulation among patients with mechanical neck pain significantly reduces pain (Miller et al., 2010) [16], (Hurwitz et al. 2008) [17] and increases cervical ROM as reported by Hurwitz et al. (2008) [17] and Hurwitz et al. (1996) [18].

On a general note, other studies have concluded that cervical manipulation improves neck pain and Cervical Range of Motion (ROM) as published by Hurwitz et al. (1996) [18], Puentedura et al. (2012) [19] and Bronfort et al. (2004) [20] which is in line with the results of this study.

Although the Experimental group of this study had significant increase in cervical forward flexion, backward extension, right and left lateral rotation post intervention, significant changes were not observed in right and left side flexion of the neck, which is contrary to the general increase in cervical range of motion in all planes as reported by previous studies (Miller et al, 2010) [16], (Hurwitz et al 2008) [17] and Hurwitz et al (1996) [18] it may be because cervical range of motion was taken as one entity not breaking it down to different planes by some studies (in the actual sense in this study, there were improvements in favour of the ETG because at pre intervention the CTG have significantly higher ROM but post intervention the ETG had increased ROM to the extent that no more significant difference between the two groups as presented in Tables 5 and 6).

Limitations: There was no follow-up after the intervention, so only the immediate effects were reported, the small sample might have failed to provide significant information that could have possibly been available from a larger sample size.

CONCLUSION

Cervical spine manipulation results in immediate improvements in pain and neck range of motion among patients with mechanical neck pain.

Acknowledgments: Physiotherapy departments where the study was conducted (Murtala Muhammad Specialist Hospital Kano and Muhammad Abdullahi Wase Specialist Hospital Kano).

Conflict of Interest: None was encountered

Source of Funding: The study was not funded

Ethical Clearance: It was obtained from the Kano State Hospitals Management Board

REFERENCES

[1] Price DD, McGrath PA, Raffi A, Buckingham B. The validation of visual analogue scales as a ratio scale measure for chronic and experimental pain. *Pain.*

1983; 17(1):45–56.
[2] Cohen S P. Epidemiology, Diagnosis, and Treatment of Neck Pain. *Mayo Clin Proc*. 2015; 90(2):284-299.
[3] Hogg-Johnson S, van der Velde G, Carroll LJ, Holm LW, Cassidy JD, Guzman J, Cote P, Haldeman S, Ammendolia C, Carragee E, Hurwitz E, Nordin M, Peloso P. 2000–2010: The burden and determinants of neck pain in the general population: results of the Bone and Joint Decade Task Force on Neck Pain and Its Associated Disorders. *Spine*. 2008;33(4 Suppl):S39–51.
[4] Al-Shamari AY, Al-Araji SM, Al-Rubaie SJ. Electrophysiological Changes in Mechanical Neck Pain Patients. *Medical Journal of Babylon*. 2013; 4 (10):870-878.
[5] Cagnie B, Danneels L, Van Tiggelen D, De Loose V, Cambier D. Individual and work related risk factors for neck pain among office workers: a cross sectional study. *Eur Spine J*. 2007; 16(5):679–686.
[6] Cote P, van der Velde G, Cassidy JD, Carroll LJ, Hogg-Johnson S, Holm LW, Carragee EJ, Haldeman S, Nordin M, Hurwitz EL, Guzman J, Peloso PM. 2000–2010: The burden and determinants of neck pain in workers: results of the Bone and Joint Decade Task Force on Neck Pain and Its Associated Disorders. *Spine*. 2008;33(4 Suppl):S60–74.
[7] Jette M, Delitto A. Physical Therapy Treatment Choices for Musculoskeletal Impairments. Phys Ther. 1997; 77:145-154.
[8] Borghouts J, Janssen H, Koes B, Muris J, Metsemakers J, Bouter L. The management of chronic neck pain in general practice. A retrospective study. *Scand J Prim Health Care*. 1999;17:215–220.
[9] Bronfort G, Haas M, Roni M, Evans L, Lex M, Bouter M. Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis. *The Spine Journal*.2004; 4(3):335–356.
[10] Drews, E. R. *A study of demographic and epidemiological factors of private chiropractic practices and a chiropractic-teaching clinic.* Master's Degree InTechnology, Durban Institute of Technology, Durban. 1994.
[11] Aker PD, Gross AR, Goldsmith CH, Peloso P. Conservative Management of mechanical low back pain: a systematic overview and a metanalysis. *British Medical Journal,* 1996;*313:* 1291-96.
[12] Cote P, Cassidy JD, Carroll LD. The Saskatchewan health and back pain survey. The prevalence of neck pain and related disability in Saskatchewan adults. *Spine*. 1998; 23(15):1689-1698.
[13] Cassidy JD, Lopes AA, Hing KY. The immediate effect of manipulation versus mobilization on pain and range of motion in the cervical spine: a randomized controlled trial. *J Manipulative Physiol Ther.* 1992; 15(9):570-5.
[14] Jaeschke R, Singer J, Guyckt G H. Measurement of Health status: Ascertaining the minimal clinically important difference. *Control clinical trial*.1989; 10 (4): 407-15.
[15] Kelly AM. The minimum clinically significant difference in visual analogue scale pain score does not differ with severity of pain. *Emerg Med J* 2001;18(3):205-207.
[16] Miller J, Gross A, D'Sylva A, Burnie S, Goldsmith CH, Graham N, Haines T, Brønfort G, Hoving JL. Manual therapy and exercise for neck pain: A systematic review. *Manual Therapy*. 2010; 15(4): 334-54.
[17] Hurwitz EL, CarrageeEJ,, van der Velde G, Carroll LJ, Nordin M, Guzman J, Peloso PM, Holm LW,, Côté P, Hogg-Johnson S, Cassidy JD, Haldeman S. Treatment of Neck Pain: Noninvasive Interventions. *Eur Spine J.* 2008 Apr; 17(Suppl 1): 123–152.
[18] Hurwitz EL, Aker PD, Adams AH, Meeker WC, Shekelle PG. Manipulation and mobilization of the cervical spine: A systematic review of the literature. *SPINE* 1996:2(15):1746-1760.
[19] Puentedura E J, March J, Anders J, Perez A, Landers M R, Wallmann H W, Cleland J A. Safety of cervical spine manipulation: are adverse events preventable and are manipulations being performed appropriately? A review of 134 case reports. J Man Manip Ther. 2012 May;20(2):66-74.
[20] Bronfort G, Haas M, Roni M, Evans L, Lex M, Bouter M. Efficacy of spinal manipulation and mobilization for low back pain and neck pain: a systematic review and best evidence synthesis. The Spine Journal.2004; 4(3): 335–356.

Citation
Mayana, K. I., Mukhtar, N. B., & Abubakar, N. (2015). IMMEDIATE EFFECT OF CERVICAL MANIPULATION ON PAIN AND RANGE OF MOTION IN PATIENTS WITH CHRONIC MECHANICAL NECK PAIN. *International Journal of Physiotherapy,* 4(3), 173-177.